SOME

PAPERS

Lately Read before the

ROYAL SOCIETY

Concerning the

Freſh-water POLYPUS;

AN

INSECT, which hath this ſurpriſing Property, That being cut into ſeveral Pieces, each Piece becomes a perfect Animal, as complete as that of which it was originally only a Part.

Collected and Publiſhed by

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For *Thurſday*, January 13. and *Thurſday*, January 21. 1742-3.

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Several Papers *relating to the* Freſh-water Polypus, *an* Inſect, *which has this ſurpriſing* Property, *that being cut into ſeveral Pieces, each Piece lives, and in a ſhort time becomes as perfect an Inſect, as that of which it was originally only a Part.*

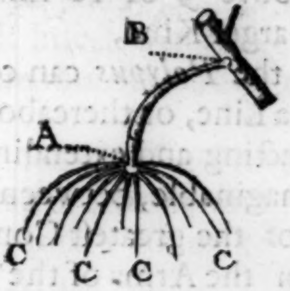
Abſtract of Part of a Letter from the Honourable William Bentinck, *Eſq*; F. R. S. *to* Martin Folkes, *Eſq*; Pr. R.S. *communicating the following Paper from Monſ.* Trembley, *of the* Hague.

SIR, *Hague, Jan.* 15. N.S. 1743.

‘WHAT I here ſend you incloſ'd will, I hope, anſwer the Queries of your laſt Letter. Mr. *Trembley*, the Gentleman who has made the Obſervations on the Inſects, has drawn this Extract from his Journal: And I can anſwer for the Truth of the Facts therein contained, as there is not one of them but what I have ſeen repeated above Twenty times. I ſend you the Paper in *French*, not having had Time to tranſlate it. I wiſh others may be encouraged to try the Experiments over-again, and ſatisfy themſelves of the Truth, by their own Eyes. The Inſects may certainly be found in *England*, if carefully lookt for, eſpecially by ſuch as are accuſtomed to ſuch Enquiries. However, if that ſhould be found difficult, it may be eaſy to ſend ſome over to you: And Mr. *Trembley* will give Directions how to keep and feed them; for he makes himſelf a *Point d'honneur* of being communicative, and concealing nothing of what he knows about them. If therefore you have any Doubt, or want any further Information, pleaſe only to write to me, or to him, and you ſhall be ſure of an Anſwer, by the firſt Opportunity. I pray to be kindly remembred—— *&c.*

The

The Figure of the Freſh-water Polypus, *ſticking to a Twig.*



Obſervations and Experiments upon the Freſh-water Polypus, *by Monſieur* Trembley, *at the* Hague. *Tranſlated from the* French *by* P. H. Z. *F. R. S.*

THE Animal in queſtion is an aquatick Inſect, of which mention is made in the *Philoſophical Tranſactions* for the Year 1703. N°. 283. *Art.* IV. *pag.* 1307. and N°. 288. *Art.* I. *pag.* 1494.

It is repreſented in the Figure annexed. Its Body *A B.* which is pretty ſlender, has on its anterior Extremity *A.* ſeveral Horns *A C.* which ſerve it inſtead of Legs and Arms, and which are yet ſlenderer than the Body. The Mouth of the *Polypus* is in that anterior Extremity; it opens into the Stomach, which takes up the whole Length of the Body *A B.* This whole Body forms but one Pipe; a ſort of a Gut, which can be open'd at both Ends.

The Length of the Body of a *Polypus* varies according to its different Species, and according to many other Circumſtances, to be mentioned hereafter.

I know two Species, of which I have ſeen ſome Individuals extend their Bodies to the Length of an Inch and a half; but this is uncommon. Few are generally found above 9 or 10 Lines long; and even theſe are of the larger Kind.

The Body of the *Polypus* can contract itſelf, ſo as not to be above a Line, or thereabouts, in Length.

Both in contracting and extending itſelf, it can ſtop at any Degree imaginable, between that of the greateſt Extenſion, and of the greateſt Contraction.

The Length of the Arms of the *Polypus* differs alſo according to the ſeveral Species: Thoſe of one of the Species that I know, can be extended to the Length of ſeven Inches at leaſt.

The Number of Legs or Arms is not always the ſame in the ſame Species. One ſeldom ſees in a *Polypus*, come to its full Growth, fewer than ſix.

The ſame may be ſaid of the Extenſion, and of the Contraction of the Arms, which I have ſaid concerning the Body.

The Body and the Arms admit of Inflexion in all their Parts, and that in all manner of Ways.

From the different Degrees of Extenſion, Contraction, and Inflexion, which the Body and the Arms of the *Polypus* admit of, reſults a great Variety of Figures, which they can form themſelves into.

Theſe Inſects do not ſwim, they crawl upon all the Bodies they meet with in the Water, upon the Ground, upon Plants, upon Pieces of Wood, *&c.*

Their moſt common Poſition is, to fix themſelves by their poſterior End *B.* to ſomething, and ſo ſtretch their Body and Arms forwards into the Water.

They make uſe of their progreſſive Motion, to place themſelves conveniently, ſo as to catch their Prey. They are voracious Animals: Their Arms extended into the Water, are ſo many Snares which they ſet for Numbers of ſmall Inſects that are ſwimming there. As ſoon as any of them touches one of the Arms, it is caught.

The *Polypus* being ſeized of a Prey, conveys it to his Mouth, by contracting or bending his Arm. If the Prey be ſtrong enough to make Reſiſtance, he makes uſe of ſeveral Arms.

A *Polypus* can maſter a Worm twice or thrice as long as himſelf. He ſeizes it, he draws it to his Mouth, and what is more, ſwallows it whole.

If the Worm comes endways to the Mouth, he ſwallows it by that End; if not, he makes it enter double into his Stomach, and the Skin of the *Polypus* gives way. The Size of the Stomach extends itſelf ſo as to take in a much larger Bulk than that of the *Polypus* itſelf, before it ſwallowed that Worm. The Worm is forced to make ſeveral Windings and Folds in the Stomach, but does not keep there long alive; the *Polypus* ſucks it, and after having drawn from it what ſerves for his Nouriſhment, he voids the Remainder by his Mouth, and theſe are his Excrements. According as the Weather is more or leſs hot, the *Polypus* eats more or leſs, oftener or leſs often.

They grow in Proportion to what they eat; they can bear to be whole Months without eating, but then they waſte in Proportion to their Faſting.

The Obſervations related in the *Philoſophical Tranſactions*, principally concern the Manner in which theſe Inſects multiply. What is there ſaid of them, is true and exact. The more one ſearches into the Manner how a *Polypus* comes from the Body of its Parent, the more evidently is one perſuaded, that it is done by a true Vegetation.

There is not on the Body of a *Polypus* any diſtinguiſhed Place, by which they bring forth their Young. I have ſome of them, that have greatly multiplied under my Eyes, and of which I might almoſt ſay, that they have produced young ones, from all the exterior Parts of their Body.

A *Polypus* does not always put forth a ſingle young one at a time; it is a common thing to find thoſe which produce five or ſix: I have kept ſome which have put forth nine or ten at the ſame Time, and when one dropt off, another came in its Place.

Theſe Inſects ſeem ſo many Stems from which iſſue many Branches. I have learned by a continual Attention to two Species of them, that all the Individuals of theſe Species produce young ones.

I have for two Years had under my Eye thouſands of them; and though I have obſerved them conſtantly, and with Attention, I never obſerved any thing like Copulation.

Upon Suppoſition, that this Copulation is perform'd in ſome ſecret Manner: I tried at firſt to be ſure it had not Place between two of them, after they were ſevered from the Body of their Parent. To this end, I took young ones, the Moment they came from the Parent, which was alone in a Glaſs; or I even parted them with Sciſſars: Each of theſe young ones I put into perfect Solitude, I fed them every one ſeparately in a Glaſs; they all multiplied, not only them-

themſelves, but alſo their Offsprings, which from Generation to Generation, as far as the Seventh, were all confined to Solitude with the ſame Precaution.

Another Fact, which I have obſerved, has proved to me, that they have the Faculty of multiplying, before they are ſevered from their Parent. I have ſeen a *Polypus*, ſtill adhering, bring forth young ones; and thoſe young ones themſelves have alſo brought forth others. Upon Suppoſition, that perhaps there was ſome Copulation between the Parent and young ones, whilſt they were yet united; or between the young ones coming from the Body of the ſame Parent; I made divers Experiments, to be ſure of the Fact; but not one of thoſe Experiments ever led me to any thing that could give the Idea of a Copulation.

The *Polypus* multiplies more or leſs, as he is more or leſs fed, and as the Weather is more or leſs warm. If plenty of Food, and a ſufficient Degree of Warmth concur, they multiply prodigiouſly.

I now proceed to the Singularities reſulting from the Operations I have tried upon them.

If the Body of a *Polypus* is cut into two Parts tranſverſly, each of thoſe Parts becomes a complete *Polypus*. On the very Day of the Operation, the firſt Part, or anterior End of the *Polypus*, that is, the Head, the Mouth, and the Arms; this Part, I ſay, lengthens itſelf, it creeps, and eats.

The ſecond Part, which has no Head, gets one; a Mouth forms itſelf, at the anterior End; and ſhoots forth Arms. This Reproduction comes about more or leſs quickly, according as the Weather is more or leſs warm. In Summer, I have ſeen Arms begin to ſprout out 24 Hours after the Operation, and the new Head perfected in every reſpect in a few Days.

Each of thoſe Parts, thus become a perfect *Polypus*, performs abſolutely all its Functions. It creeps, it eats, it grows, and it multiplies; and all that, as much as a *Polypus* which never had been cut.

In whatever Place the Body of a *Polypus* is cut, whether in the Middle, or more or leſs near the Head, or the poſterior Part, the Experiment has always the ſame Succeſs.

If a *Polypus* is cut tranſverſly, at the ſame Moment, into three or four Parts, they all equally become ſo many complete ones.

The Animal is too ſmall to be cut at the ſame time into a great Number of Parts; I therefore did it ſucceſſively. I firſt cut a *Polypus* into four Parts, and let them grow; next, I cut thoſe Quarters again; and at this rate I proceeded, till I had made 50 out of one ſingle one: And here I ſtopp'd, for there would have been no End of the Experiment.

I have now actually by me ſeveral Parts of the ſame *Polypus*, cut into Pieces above a Year ago; ſince which time, they have produced a great Number of young ones.

A *Polypus* may alſo be cut in two, lengthways. Beginning by the Head, one firſt ſplits the ſaid Head, and afterwards the Stomach: The *Polypus* being in the Form of a Pipe, each Half of what is thus cut lengthways forms a Half-pipe; the anterior Extremity of which is terminated by the half of the Head, the half of the Mouth, and Part of the Arms. It is not long before the two Edges of thoſe Half-pipes cloſe, after the Operation: They generally begin at the poſterior Part, and cloſe up by degrees to the anterior Part. Then, each Half-pipe becomes a Whole-one, complete: A Stomach is formed, in which nothing is wanting; and out of each Half-mouth a Whole-one is formed alſo.

I have ſeen all this done in leſs than an Hour; and that the *Polypus*, produced from each of thoſe Halves, at the End of that time did not differ from the Whole-ones, except that it had fewer Arms; but in a few Days more grew out.

I have cut a *Polypus*, lengthways, between Seven and Eight in the Morning; and between Two and Three in the Afternoon, each of the Parts has been able to eat a Worm as long as itſelf.

If a *Polypus* is cut lengthways, beginning at the Head, and the Section is not carried quite through; the Reſult is, a *Polypus* with two Bodies, two Heads, and one Tail. Some of thoſe Bodies and Heads may again be cut, lengthways, ſoon after. In this manner I have produced a *Polypus* that had ſeven Bodies, as many Heads, and one Tail. I afterwards, at once, cut off the ſeven Heads of this new *Hydra:* Seven others grew again; and the Heads, that were cut off, became each a complete *Polypus*.

I cut a *Polypus*, tranſverſly, into two Parts: I put theſe two Parts cloſe to each other again, and they reunited where they had been cut. The *Polypus*, thus reunited, eat the Day after it had undergone this Operation: It is ſince grown, and has multiplied.

I took the poſterior Part of one *Polypus*, and the anterior of another, and I have bronght them to reunite in the ſame manner as the foregoing: Next Day, the *Polypus* that reſulted, eat: It has continued well theſe two Months, ſince the Operation: It is grown, and has put forth young ones, from each of the Parts of which it was formed. The two foregoing Experiments do not always ſucceed; it often happens, that the two Parts will not join again.

In order to comprehend the Experiment I am now going to ſpeak of, one ſhould recollect, that the whole Body of a *Polypus* forms only one Pipe, a ſort of Gut, or Pouch.

I have been able to turn that Pouch, that Body of the *Polypus*, inſide-outwards; as one may turn a Stocking.

I have ſeveral by me, that have remained turned in this manner; their Inſide is become their Outſide, and their Outſide their Inſide: They eat, they grow, and they multiply, as if they had never been turned.

Facts like theſe I have related, to be admitted, require the moſt convincing Proofs. I venture to ſay, I am able to produce ſuch Proofs.

They ariſe from the Detail of my Experiments, from the Precautions I have taken to avoid all Uncertainties, from the Care I have uſed to repeat the ſame Experiment ſeveral times, from the Aſſiduity and Attention with which I have obſerved them.

All this would require a Diſcuſſion too long to be here related.

I might alſo appeal to the Quality and the Number of the Perſons who have been Witneſſes to theſe Facts; as well of thoſe who have ſeen *me* obſerve, as of thoſe who have obſerved *themſelves*.

For Brevity-ſake, I have omitted ſeveral curious and material Facts.

If any Perſons in *England* ſhall be deſirous to make Obſervations on the *Polypus*, and to repeat my Experiments; I hope I ſhall be able to ſend ſome over, in caſe they ſhall not be found there.

They are to be look'd for in ſuch Ditches whoſe Water is ſtock'd with ſmall Inſects. Pieces of Wood, Leaves, aquatic Plants, in ſhort, every thing is to be taken out of the Water, that is met with at the Bottom, or on the Surface of the Water, on the Edges, and in the Middle of the Ditches. What is thus taken out, muſt be put into a Glaſs of clear Water, and theſe Inſects, if there are any, will ſoon diſcover themſelves; eſpecially if the Glaſs is let ſtand a little, without moving it; for thus the Inſects, which contract themſelves when they are firſt taken out, will again extend themſelves when they are at Reſt, and become thereby ſo much the more remarkable.

In order to feed them, one muſt know how to provide one's ſelf with Inſects fit for their Food.

If that is thought neceſſary, I will point out the Means I make uſe of for that Purpoſe.

I am ready to impart to every one who ſhall deſire to make Obſervations on theſe Animals, all the Means and Contrivances I have uſed; to enable them to practiſe the ſame, and to judge of them.

I ſhall ſet forth all theſe Means and Contrivances in the Hiſtory of the *Polypus*, which I am now at work upon. But if, before its Publication, any Informations ſhould be deſired, I again repeat, that I ſhall be ready and willing to furniſh them.

An Abſtract of what is contained in the Preface to the Sixth Volume of Monſ. Reaumur's Hiſtory *of* Inſects, *relating to the abovementioned Obſervations, and delivered in to the* ROYAL SOCIETY, *immediately after the foregoing Paper.*

AS the Sixth Volume of Monſ. *Reaumur's Hiſtory of Inſects*, juſt publiſh'd at *Paris*, is not yet come over, ſo as to be met with among the Bookſellers here: I thought a ſhort Extract of what he there ſays, in his Preface, relating to the Subject of Monſieur *Trembley's* Paper, might not be unacceptable, to the Gentlemen of the SOCIETY preſent.

He there obſerves, that tho', in the Hiſtories he has already given of minute Animals in this Work, he has had occaſion to produce many new and unexpected Phænomena: One he has now to mention would exceed all Belief, if it was not confirmed by the ſtrongeſt repeated Obſervations; which is, that there are Species of Inſects, who are multiplied by being cut to Pieces, and among which, one ſingle Animal, divided into 8, 10, 20, 30, or 40 Parts, becomes ſo many entire Animals, each ſimilar to that of which it was at firſt only a Piece. This Animal, being one of thoſe that undergo no Change in their common Form, does not belong to the Deſign of this preſent Volume, which treats only of ſome of thoſe, which, having been firſt a Worm or Maggot, are then changed into a Chryſalis, and from thence, either into a Fly or Scarabee.

Yet Monſ. ***Reaumur*** obſerves, the Number of Queſtions that had been put to him concerning this Inſect, as well by Perſons at home, as by his Correſpondents abroad, had made him think he ought not to defer giving now ſome Satisfaction to the Curioſity of the Publick. Beſides that he found himſelf obliged, to give in this manner his Atteſtation to the Truth of this Fact, firſt obſerved by Mr. *Trembley*, a Gentleman of *Geneva*, now reſiding in *Holland*, and confirmed by Numbers of the moſt curious and accurate Experiments: Which Atteſtation he alſo obſerves, in ſo ſtrange a Fact, could hardly be expected to have ſufficient Weight, ſhould he not ſay enough to put his Readers in a Condition to obſerve themſelves, and ſee with their own Eyes, the Truth of the Particulars he relates.

Mr. *Trembley*, about two Years and a half ſince, obſerving the numerous Inſects, with which the Water of a Ditch, covered with Duck-weed, was plentifully ſtock'd, diſcovered ſome odd-ſhaped Bodies, of a greeniſh Colour, concerning which he was doubtful whether to look on them as Plants or Inſects; he thought, by cutting them, to aſſure himſelf to which of theſe Claſſes they properly belonged; as ſuppoſing, if to the former, they would probably not be deſtroyed by cutting, but vegetate again: They ſeemed to do ſo; and upon this, he was inclined to look on them as a Sort of Water Senſitives; till freſh Experiments every Day ſhewed him new Operations. They diſcovered a ſort of voluntary locomotive Faculty; they ſeemed to ſeek the Light; they caught other Inſects, and they devoured them with great Eagerneſs. This threw him into freſh Amazement; yet a prudent Diffidence ſtill

hindered

hindered him from pronouncing poſitively concerning them; he communicated his Obſervations, and diſpatched ſome of the Inſects themſelves to Monſieur *Reaumur*, in *December* 1740. *He*, he ſays, repeated all Mr. *Trembley*'s Experiments, and not only by himſelf, but with Monſ. *Bernard de Juſſieu*, of the *Royal Academy of Sciences*, and of this SOCIETY, and with ſeveral more of the *Academy*. The Experiments ſucceeded as they had done in *Holland*, and they were all convinced they could not refuſe acknowledging the Inſects in queſtion, to be really ſuch: however new and ſurpriſing their Properties appeared.

Monſieur *Reaumur* then gives a general and very ſuccinct Account of the Experiments tried by Mr. *Trembley* and himſelf; which agreeing perfectly with what is contained in the Paper juſt read to the SOCIETY, I avoid again tranſcribing. I ſhall only add, that he ſays, when he, the firſt time, ſaw two complete Animals forming themſelves from the Parts of one *Polypus* cut aſunder, he did not know how to believe his Eyes; and that he can hardly yet ſee it without freſh Amazement, after Experiments a hundred and a hundred times repeated. He avoids, he tells us, entering into further Details of Particulars, as theſe will be ſeen in the Work Mr. *Trembley* is actually finiſhing upon this Head; the Publication of which, he ſays, would be expected with the utmoſt Impatience, if the Public could know, as he does, how many curious Facts they will there find; and with what Pleaſure they will read the Account of the ingenious Means, by which that Gentleman has enabled himſelf, to come at the Knowledge of ſo many ſtrange and ſingular Truths.

Theſe Experiments were no ſooner known among the Curious in *France*, but it was preſently imagined, theſe Inſects were not the only Species to which Nature had given ſo extraordinary a Faculty: And numberleſs Obſervations were made to that Purpoſe. Monſieur *Bonnet* was not long before he found a very ſlender Water-worm, of about an Inch and a half long, that had the ſame Property; and Monſieur *Lyonett* diſcovered another above three Inches long, and of the Thickneſs of the Treble String of a Violin, that being cut into 30 and 40 Parts, afforded the ſame Phænomena. Monſieur *Reaumur* was deſirous, if poſſible, to ſee the Succeſs of theſe Experiments in ſome Animals of a larger Size; and inclin'd to believe ſome Sea Productions, not very unlike in Shape to theſe Freſh-water ones, together with other Bodies among thoſe diſtinguiſhed by the Name of *Urticæ Marinæ*, and Star-fiſh, might not improbably be endowed with the like Faculties; he engaged Monſieur *Guettard*, and Monſieur *Juſſieu*, to be aſſiſtant in making Variety of Experiments by the Sea-ſide, on theſe ſeveral Sorts of Bodies; the firſt was on the Coaſts of *Poictou*, the other on thoſe of *Normandy*; and they were ſoon ſufficiently ſatisfied, the ſame Laws of Nature had Place in theſe Sorts of Animals alſo. Many of the Star-fiſh Kind particularly, and which uſually conſiſt of five equal *Radii* or Arms, were found wanting, ſome one, others two, three, or four, of thoſe *Radii*; and Nature was reproducing in them the *Radii* wanting. Monſieur *Juſſieu* broke and cut Star-fiſh into ſeveral Parts; he had the Pleaſure to ſee thoſe ſeveral Parts continue alive, and to obſerve their Wounds to cicatrize and heal, though he could not ſtay long enough in the Country to ſee the new Parts break out, in the room of thoſe he had cut away; which has been however, ſupplied by Monſieur *Girard de Villars*, who, on the Coaſts near *Rochelle*, has ſeen the *Urticæ* reproduce all that had been cut off, and the Parts of the Stars alſo putting out each new *Radii* in the room of thoſe he had deprived them of. Monſieur *Juſſieu* alſo reported, that this Fact in the Star-fiſh, ſo new to him, was not ſo to the common Fiſhermen of the Country, who ſeeing him tearing and cutting to Pieces one of thoſe Animals, told him, *Qu'il auroit beau faire, qu'il ne parviendroit pas à leur ôter la vie*: Thoſe poor People having been accuſtomed to ſee daily a Fact, the more philoſophical Part of Men had never ſo much as heard of.

Monſieur *Reaumur*, though very ſenſible that Water Inſects had a conſiderable Advantage over others for the Recovery of their Wounds, was yet willing to try if ſome Land Inſects might not poſſibly afford alſo ſome like Obſervations; and after ſeveral Trials, both he and Monſieur *Bonnet*, have met with ſome Sorts of Earth Worms capable of bearing the Operation. Monſieur *Reaumur* has cut in two ſome of theſe Worms; the anterior Part, that to which the Head belong'd, ſeem'd to have little ſuffer'd: In leſs than two Days, the *Anus* was form'd again, as it had been before, and the Worms were complete to all Purpoſes, but that they were ſhorter, and wanted of their Length: They lengthened, however, by degrees, the Number of the Rings of which they are compoſed increaſed, and they came again to their firſt Length at the End of ſome Months. But the poſterior Part of the Worms, that to which the Tail belonged, wanted Matters of another Conſequence; that Part had loſt not a Head only, but the Parts of Generation alſo of both Sexes; which in thoſe Creatures are placed not very diſtant from the Head: And to reproduce all theſe was the Work of ſome Months; it has, however, in many Inſtances, been done after that Time; and ſeveral of theſe hinder Parts of Worms have again become complete Worms, having each both a Head, and Male and Female Parts of Generation, and in as complete a Manner, as the whole Worms had before their Section. Tho' many, indeed, have died during the Operation, before the Reproduction was made complete: Yet, as in various Inſtances, where proper Care has been taken, the Experiment has ſucceeded; it is equally to be regarded, as if the making it required neither ſo long Time, nor ſo much Care.

This general Account of what is relating to this Subject, in the Preface to Monſieur *Reaumur*'s new Volume, I hoped might not be diſagreeable to the Company, as it might in ſome meaſure gratify their preſent Curioſity, till this Preface itſelf, and Monſieur *Trembley*'s own Book, ſhall be in every Body's Hands.

FINIS.